We claim:

1. A method of surgical navigation, the method comprising the steps of:

Acquiring a first image of part of a patient on a first surface of creation wherein the image is captured using a first imaging system,

Acquiring a first pose of the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured,

Acquiring a first pose of the surface of creation with respect to the part of the patient when the part of the patient and the first imaging system are in substantially the same pose with respect to one another that the part of the patient and the first image are in when the first image is captured,

Setting a first pose of a virtual guard with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the first surface of creation.

2. The method of claim 1 further comprising the steps of:

Acquiring a second image of the part of the patient on a second surface of creation wherein the image is captured using a second imaging system,

Acquiring a second pose of the part of the patient when the part of the patient is in substantially the same pose that the part is in when the second image is captured,

Acquiring a second pose of the second surface of creation with respect to the part of the patient when the part of the patient and the second imaging system are in substantially the same pose with respect to one another that the part of the patient and the second image are in when the second image is captured,

Setting a second pose of a second virtual surface of creation with respect to the part of the patient as if the part of the patient is positioned with respect to the second virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the second surface of creation,

Setting a second pose of the virtual guard with respect to the second virtual surface of creation.

3. The method of claim 1 wherein the imaging system is a projective imaging system.

4. The method of claim 3 further comprising the steps of:

Acquiring a pose of the first imaging system with respect to the first surface of creation,

Setting a first pose of a first virtual imaging system with respect to the first virtual surface of creation,

Projecting a first virtual image of the virtual guard onto the first virtual surface of creation using the first virtual imaging system.

5. The method of claim 2 wherein the second imaging system is a projective imaging system.

6. The method of claim 5 further comprising the steps of:

Acquiring a pose of the second imaging system with respect to the second surface of creation,

Setting a second pose of a second virtual imaging system with respect to the second virtual surface of creation,

Projecting a second virtual image of the virtual guard onto the second virtual surface of creation using the second virtual imaging system.

7. A method of surgical navigation, the method comprising the steps of:

Acquiring a first image of part of a patient on a first surface of creation wherein the image is captured using a first imaging system,

Acquiring a first pose of the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured,

Acquiring a first pose of the surface of creation with respect to the part of the patient when the part of the patient and the first imaging system are in substantially the same pose with respect to one another that the part of the patient and the first image are in when the first image is captured,

Acquiring a first pose of a tool,

Setting a first pose of a virtual form of the tool with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual surface of creation in the

same geometric relationship that the part of the patient has with respect to the first surface of creation.

8. The method of claim 7 wherein the first imaging system is a projective imaging system.

9. The method of claim 8 further comprising the steps of:

Acquiring a pose of the first imaging system with respect to the first surface of creation,

Setting a first pose of a first virtual imaging system with respect to the first virtual surface of creation,

Projecting a first virtual image of the virtual form of the tool onto the first virtual surface of creation using the first virtual imaging system.

10. A method of surgical navigation, the method comprising the steps of:

Acquiring a first image of part of a patient on a first surface of creation wherein the image is captured using a first imaging system,

Acquiring a first pose of the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured,

Acquiring a first pose of the surface of creation with respect to the part of the patient when the part of the patient and the first imaging system are in substantially the same pose with respect to one another that the part of the patient and the first image are in when the first image is captured,

Setting a first pose of a first virtual surface of creation with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the first surface of creation,

Setting a first pose of a first virtual guard with respect to a first virtual surface of creation,

Acquiring a first pose of a tool,

Setting a first pose of a virtual form of the tool with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the first surface of creation.

11. The method of claim 10 wherein the first imaging system is a projective imaging system.

12. The method of claim 11 further comprising the steps of:

Acquiring a pose of the first imaging system with respect to the first surface of creation,

Setting a first pose of a first virtual imaging system with respect to the first virtual surface of creation,

Projecting a first virtual image of the virtual form of the tool onto the first virtual surface of creation using the first virtual imaging system.

13. The method of claim 11 further comprising the steps of:

Acquiring a pose of the first imaging system with respect to the first surface of creation,

Setting a first pose of a first virtual imaging system with respect to the first virtual surface of creation,

Projecting a first virtual image of the virtual guard onto the first virtual surface of creation using the first virtual imaging system.

14. The method of claim 10, further comprising:

Acquiring a pose of the tool on an ongoing basis,

Acquiring a pose of the part of the patient on an ongoing basis,

Resetting the first pose of the virtual form of the tool on an ongoing basis to compensate for changes of the pose of the tool with respect to the part of the patient.

15. The method of claim 1, 7 or 10, further comprising the step of storing the acquired images on a computer readable medium after the images are acquired.

16. The method of claim 1, 7 or 10, further comprising the step of displaying each acquired image together with one or more of the virtual images created from the same projected perspective.

17. The method of claim 1, 7 or 10, further comprising the step of displaying one or more virtual images, where multiple virtual images are created from the same projected perspective, without displaying an acquired image.

18. The method of claim 1, further comprising performing the steps of claim 1 for a plurality of images of the part of the patient.

19. The method of claim 1, further comprising performing the steps of claim 1 for a plurality of guards.

20. The method of claim 7, further comprising the steps of claim 7 for a plurality of tools.

21. The method of claim 10, further comprising the steps of claim 10 for a plurality of guards.

22. The method of claim 21, further comprising the steps of claim 10 for a plurality of tools.

23. The method of claim 10, further comprising the steps of claim 10 for a plurality of tools.

24. The method of claim 20, 22 or 23, further comprising the step of calculating relative pose information of a tool and another tool.

25. The method of claim 10, further comprising the step of calculating relative pose information of the tool and the guard.

26. The method of claim 25, further comprising the step of displaying relative pose information of the tool and the guard.

27. The method of claim 26, wherein the relative pose information is displayed by displaying images of the tool and guard.

28. The method of claim 26, wherein the relative pose information is displayed audibly.

29. The method of claim 26, wherein the relative pose information is displayed visually in the form of numerical data.

30. The method of claim 26, wherein the relative pose information is displayed graphically.

31. The method of claim 22, further comprising the step of calculating relative pose information of one or more tools and one or more guards.

32. The methods of claims 7 and 10, wherein the tool is selected from a group consisting of drills, probes, saws, guides, probes, or another physical objects that a practitioner can directly or indirectly manipulate.

33. The method of claim 20, 22 or 23, wherein tools are selected from a group consisting of drills, probes, saws, guides, probes, or another physical objects that a practitioner can directly or indirectly manipulate.

34. The method of claim 19 or 21, wherein guards are selected from a group consisting of drill holes, probe holes, saw cuts, guide holes, probe holes, or another three-dimensional computer representation of a geometrical entity.

35. The method of claim 1, 7 or 10, wherein images are acquired by capturing the images from the patient using an imaging system.

36. The methods of claim 35, wherein the imaging system is an X-ray system.

37. The methods of claim 35, wherein the imaging system is an ultrasound system.

38. The method of claim 1, 7 or 10, wherein images are acquired by retrieving from a computer readable file previously captured images.

39. The method of claim 1, 7 or 10, wherein poses are acquired by tracking poses using a tracking system.

40. The methods of claim 39, wherein the tracking system transmits signals from items and receives transmitted signals at a sensor, and the tracking system determines poses from the received transmitted signals.

41. The method of claim 1, 7 or 10, wherein poses are acquired by retrieving from a computer readable file previously tracked poses.

42. The method of claim 1, 7 or 10, wherein poses are acquired by retrieving from a computer readable file previously tracked poses.

43. The method of claim 1, 7 or 10, wherein image are geometrically corrected to represent substantially a product of projective geometry only, and not of artifacts or distortions introduced by an imaging system, whether calculated from geometry or calculated by processing an image derived from an imaging system.

44. An apparatus for use in surgical navigation, the apparatus comprising:

a tracking system for tracking objects,

an imaging system for acquiring 2-dimensional images of objects,

a communication system for receiving input from and providing output to a user,

an integration system for correlating images acquired at different times or using different means of acquisition,

a computing platform, and

computer program means on computer readable media for use on the computer platform, the computer program means comprising:

instructions to carry out the steps of the method of claim 1, 7 or 10 using the tracking system, imaging system, communication system and integration system.

45. The apparatus of claim 44, wherein the tracking system comprises:

one or more transmitters on each object for transmitting a signal,

and one or more sensors for receiving transmitted signals, the transmitter determining a pose of an object using the received transmitted signals.

46. A computer program on a computer readable medium for use on a computer platform in association with a tracking system for tracking objects, an imaging system for acquiring 2-dimensional images of objects, a communication system for receiving input from and providing output to a user, an integration system for correlating images acquired at different times or using different means of acquisition, the computer program comprising:

instructions to carry out the steps of the method of claim 1, 7 or 10 using the tracking system, imaging system, communication system and integration system.

47. An apparatus for use in surgical navigation, the apparatus comprising:

a tracking system for tracking objects,

an imaging system for acquiring 2-dimensional images of objects,

an integration system for correlating images acquired at different times or using different means of acquisition,

wherein the imaging system acquires a first image of part of a patient on a first surface of creation, the image is captured using a first imaging system,

the tracking system acquires a first pose of the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured,

the tracking system acquires a first pose of the first imaging system with respect to the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured,

the tracking system acquires a first pose of the surface of creation with respect to the part of the patient when the part of the patient and the first imaging system are in substantially the same pose with respect to one another that the part of the patient and the first image are in when the first image is captured,

the integration system sets a first pose of a first virtual imaging system with respect to a first virtual surface of creation,

the integration system sets a first pose of a virtual guard with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual imaging system and the first virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the first imaging system and the first surface of creation,

the integration system projects a first virtual image of the guard onto the first virtual surface of creation using the first virtual imaging system.

48. An apparatus for use in surgical navigation in association with an acquired first image of part of a patient on a first surface of creation, the image captured using a first imaging system; an acquired first pose of the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured, an acquired first pose of the first imaging system with respect to the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured, and an acquired first pose of the surface of creation with respect to the part of the patient when the part of the patient and the first imaging system are in substantially the same pose with respect to one another that the part of the patient and the first image are in when the first image is captured, the apparatus comprising:

an integration system for correlating images acquired at different times or using different means of acquisition,

wherein the integration system sets a first pose of a first virtual imaging system with respect to a first virtual surface of creation,

wherein the integration system sets a first pose of a virtual guard with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual imaging system and the first virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the first imaging system and the first surface of creation,

and wherein the integration system projects a first virtual image of the guard onto the first virtual surface of creation using the first virtual imaging system.

49. An apparatus for use in surgical navigation in association with an acquired first image of part of a patient on a first surface of creation, the image captured using a first imaging system; an acquired first pose of the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured, an acquired first pose of the first imaging system with respect to the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured, an acquired first pose of the surface of creation with respect to the part of the patient when the part of the patient and the first imaging system are in substantially the same pose with respect to one another that the part of the patient and the first image are in when the first image is captured, and an acquired first pose of a tool, the apparatus comprising:

an integration system for correlating images acquired at different times or using different means of acquisition,

wherein the integration system sets a first pose of a first virtual imaging system with respect to a first virtual surface of creation,

wherein the integration system sets a first pose of a virtual form of the tool with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual imaging system and the first virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the first imaging system and the first surface of creation,

and wherein the integration system projects a first virtual image of the tool onto the first virtual surface of creation using the first virtual imaging system.

50. An apparatus for use in surgical navigation in association with an acquired first image of part of a patient on a first surface of creation, the image captured using a first imaging system; an acquired first pose of the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured, an acquired first pose of the first imaging system with respect to the part of the patient when the part of the patient is in substantially the same pose that the part is in when the first image is captured, and an acquired first pose of the surface of creation with respect to the part of the patient when the part of the patient and the first imaging system are in substantially the same pose with respect to one another that the part of the patient and the first image are in when the first image is captured, and an acquired first pose of a tool, the apparatus comprising:

an integration system for correlating images acquired at different times or using different means of acquisition,

wherein the integration system sets a first pose of a first virtual imaging system with respect to a first virtual surface of creation,

wherein the integration system sets a first pose of a virtual form of the tool with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual imaging system and the first virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the first imaging system and the first surface of creation,

wherein the integration system projects a first virtual image of the tool onto the first virtual surface of creation using the first virtual imaging system,

wherein the integration system sets a first pose of a virtual guard with respect to the part of the patient as if the part of the patient is positioned with respect to the first virtual imaging system and the first virtual surface of creation in the same geometric relationship that the part of the patient has with respect to the first imaging system and the first surface of creation,

and wherein the integration system projects a first virtual image of the guard onto the first virtual surface of creation using the first virtual imaging system.